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ORIGINAL RESEARCH

Familial Resilience in Crisis: Navigating the Mediating Landscape of Depressive Symptoms Between Uncertainty Stress and Suicide Behavior Among Chinese University Students

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Background: Previous findings indicate that stress has a profound influence on suicide behavior, but the potential mediating and moderating mechanisms are unknown between uncertainty stress and suicide behavior. The present study, therefore, examined the relationship between uncertainty stress and suicide behavior, the mediating effect of depressive symptoms, and the moderating effect of family relationship in a sample of university students in China.

Methods: 1828 university students were assessed anonymously by using the Uncertainty Stress Scale, Center for Epidemiologic Studies Depression Scale, Brief Suicidal Scale, and Family Relationship Scale between May to June in 2021. SPSS 26.0 was used for descriptive statistics and Spearman correlation analysis. PROCESS 3.5 was used to calculate the significance of the mediating and moderating effects of the variables.

Results: Moderated mediation model analyses showed that: (a) depressive symptoms partially mediated the link between uncertainty stress and suicide behavior (indirect effect = 0.14, 95%bootstrap CI = 0.10, 0.19). The indirect effect of the depressive symptoms accounted for 67.12% of the total variance in suicide behavior. (b) The indirect association between uncertainty stress and suicide behavior was moderated by family relationship. Specifically, the paths from uncertainty stress to depressive symptoms (interact effect = −0.06, $P<0.001$) and depressive symptoms to suicide behavior (interact effect = −0.08, $P<0.01$) were weakened in the context of higher family relationship.

Conclusion: Depressive symptoms play a crucial role in bridging uncertainty stress and suicide behavior, while the family relationship can buffer the mediation impact of depressive symptoms. These findings significantly contribute to the prevention and intervention of suicide in Chinese university students.

Keywords: uncertainty stress, depressive symptoms, suicide behavior, family relationship, university students

Introduction

Suicide is a high-profile public health problem. According to the World Health Organization, more than 700,000 individuals commit suicide each year globally,[1] making it the fourth greatest cause of death for 15–29 aged people.[2] Although the suicide rate in China has been slowly declining in recent years,[3] it is still a significant cause of death among university students.[4] One study among Chinese and American universities discovered that Chinese students report higher scores of suicidal ideation than American students.[5] A large sample survey of suicide found 18% of the university students showed high suicide ideation, 18.8% had suicide plans, and 1% had attempted suicide in China.[6] Suicide among young people is a buskin that affects families, schools, and entire nations and has an enduring negative effect on society.

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College is an essential period for young people to transition from school to society. With the social transformation and rapid economic development, university students have to confront multiple pressures from academic overload, constant pressure to succeed, and competition with peers.[7] Many scholars have conducted extensive studies on the relationship between diverse stressors and suicide. They found the most common stress among university students is life pressure, academic pressure, lovelorn, and high expectations from family, which are also risk factors for suicide.[8–10] Still, in fact, current studies are limited to specific stressors, and uncertain stress rarely attracts our attention.

Uncertainty Stress and Suicide Behavior

Suicide is complex, consisting of a set of behaviors from suicide ideation, plan, attempt, and suicide death.[11] Stress is a significant positive predictor of suicide behavior. The greater the stress an individual experiences, the stronger their suicidal behaviors they will commit.[12] Uncertainty stress refers to the pressure caused by being unsure about someone or something.[13] It is persistent pressure and even more stressful than knowing the inevitability of something terrible happening.[13,14] Yang's study shows that about 43% of urban residents have moderate or severe uncertainty stress.[15] Additionally, a series of research and evidence support uncertainty as a powerful stressor and has a more negative effect on mental and physical health,[16–18] which indicates uncertainty stress is a serious social and public health problem in China. Likewise, the uncertainty stress among Chinese university students is also worth paying adequate attention. Although stress is a risk factor for suicide, the relationship between uncertainty stress and Suicidal behavior among university students has not been thoroughly studied. So, it can pre-assume that there is a possible relationship between uncertainty stress and suicide behavior among Chinese university students.

Depressive Symptoms as a Mediator

Nevertheless, not all stress directly causes suicide behavior. General strain theory believes that when individuals experience stress or tension, they will produce one or more negative emotions, such as disappointment, depression, fear, etc. These negative emotions may induce individual non-adaptive behaviors.[19] We speculate that another factor mediates the relationship between uncertainty stress and suicide behavior. Research has found that the uncertainty of illness not only affects people's quality of life,[20,21] but also induces anxiety, depression, and other negative emotions.[22,23] Furthermore, the stress of uncertainty in medical work also causes lower job satisfaction and more anxiety among doctors,[24] thus leading to more working stress and job burnout.[25] Not only that, but university students seem to be more sensitive and vulnerable to uncertainty stress.[18] University students with high uncertainty stress are more susceptible to Internet addiction,[26] unintentional injury,[27] alcohol abuse,[28] deliberate self-harm,[17] and maybe it is a precursor to depression.[18] Besides, there is substantial comorbidity between depression and suicide. Numerous studies have verified that depression is a strong predictor of suicide behavior, and suicide behavior signifies a greater possibility of depression.[29–31] Generally, depression is very likely to be the precursor of uncertainty stress leading to suicide behavior among university students. So based on the general strain theory, we hypothesized that depressive symptoms might mediate the relationship between uncertainty stress and suicide behavior.

Family Relationship as a Moderator

Although stress is often thought to increase the risk of suicide, university students may not all be equally sensitive to uncertainty stress. The effect of uncertainty stress on suicide may be mitigated by specific personal situations. We suggest one such potential rescue factor is family relationship. Family relationship, including marital relationship and parent-child relationship,[32] is an essential source of social support for university students to cope with stress.[33] This implies that individuals with better family support can reduce psychological risks associated with life stress.[34] According to attachment theory, individuals with secure attachment have stronger self-efficacy and better cope with pressure, which can make them have a more positive and optimistic attitude towards life.[35,36] In contrast, those with insecure attachments tend to have maladjustment psychology and behavior. Depression is associated with a frustrating sense of belonging.[37] One case-control study found that depressed patients usually show insecure attachments, more anxiety, and avoidance and suicide attempts were also more common in depressed people with fearful attachments.[31] Based on this, we propose family relationship plays a moderating role in the mediating effect of depressive symptoms between uncertainty stress and suicide behavior among Chinese university students.

The Present Study

A moderated mediation model was constructed to examine the association between uncertainty stress and suicide behavior in Chinese university students. Two main questions need to be answered: (a) whether depressive symptoms play a mediating role in the relationship between uncertainty stress and suicide behavior, (b) whether family relationship moderates the mediating effect of depressive symptoms in the association between uncertainty stress and suicide behavior. We believe this study will provide a solid basis for the scientific prevention and treatment of suicide behavior in Chinese university students. Figure 1 illustrates the proposed model.

Materials and Methods

Participants

A cross-sectional survey among university students was carried out from May to June 2021 across three cities (Wuhan, Nanjing, and Xuzhou). Stratified multistage cluster sampling technique was used to choose each participant randomly from a pool of 25 colleges. Firstly, stratified sampling method was adopted to select schools in each city randomly according to the school level. Then, in each university, several classes are randomly selected by taking the major categories as indicators. Lastly, all of the students in the classes are investigated by an anonymous online survey, which was conducted through the Wechat platform. The caveat is that this survey is voluntary and does not offer any incentive. The participants reserve the right to withdraw or cooperate. In the end, a total of 2033 undergraduates participated in the survey. After excluding unreliable or inconsistent questionnaires (logical errors or response time less than 60s), a total of 1828 undergraduates were included in the analysis, with an effective response rate of 89.91%. The survey was conducted according to the guidelines of the Declaration of Helsinki and approved by the Medical Ethics Committee of Xuzhou Medical University. All participants gave informed consent.

Measuring Instruments

Demographic Characteristics

Demographic information included age, gender grade, only-child, ethnicity, residence, sexual orientation, and living expenses to understand the characteristics of the participants.

Uncertainty Stress

The uncertainty pressure in daily life was measured by the Uncertainty Stress Scale compiled by Yang et al[13,18] The scale is composed of 10 items by four subscales: Current status uncertainty, social change uncertainty, goal uncertainty, and social value uncertainty. Each subscale was rated on a standard 5-point Likert scale from 0 (no stress) to four (excessive stress), and the additive score of all subscales is the total stress score. A higher score indicates a greater degree of stress related to uncertainty. The Cronbach's α of the scale was 0.951.

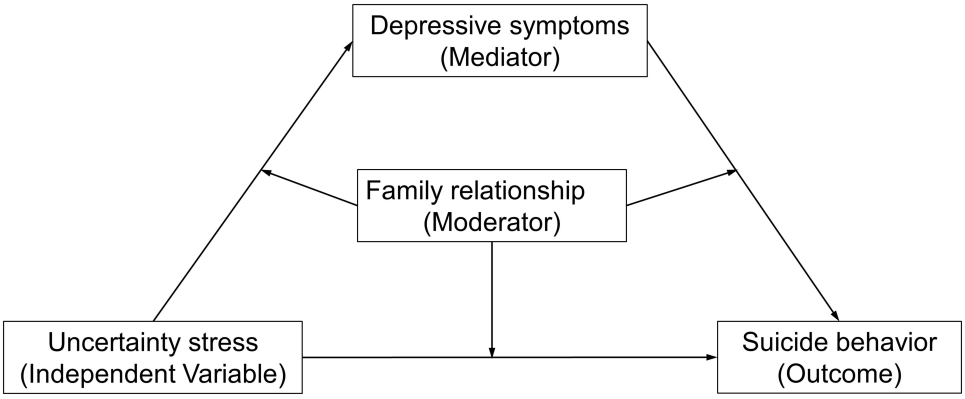

Figure 1 The hypothesis model of the relationships between uncertainty stress, depressive symptoms, suicide behavior, and family relationship.

Depressive Symptoms

A 10-item questionnaire Center for Epidemiologic Studies Depression Scale (CESD-10) revised by Andresen et al[38] was used to measure depressive symptoms in the past week, which is a condensed version of the CESD-20.[39] The scale was rated on a Likert scale from 0 (rarely or none of the time) to 3 (all the time). Item five and Item eight are scored inversely. The 10-item total score is generated to evaluate depression; the higher score indicates the more severe depressive symptoms. In the current investigation, Cronbach's α of the scale was 0.869.

Suicide Behavior

Suicide behavior was measured by Brief Suicidal Scale we developed in this study. Participants were asked if they had suicidal ideation. Participants who reported having suicidal ideation were then asked whether they had suicidal plans. The question on suicidal ideation was as follows: "Have you ever had suicidal ideation during the past 12 months? (0 = no, 1 = yes)". The subsequent item for suicide plan was as follows: "Have you ever had a plan of taking your own life during the past 12 months? (0 = no, 2 = yes)". Finally, suicide attempts were assessed if the participants have suicide plan: "Have you ever attempted to take your own life during the past 12 months? (0 = no, 3 = yes)". Finally, the overall score was between 0 and 3. A higher score indicates a high tendency to commit suicide.

Family Relationship

Family relationship was measured by Family Relationship Scale compiled by Zhang et al.[40] The scale was composed by 4 items. Three of the questions were self-reported by respondents about their relationship with father and mother and the relationship between their parents. Another question was asked about the atmosphere in their family. The scale was rated on a standard 4-point Likert scale from one (very disharmonious) to four (very harmonious). The sum of all the question scores is the total family relationship score. A higher score indicated a better relationship with the family. The scale has shown good reliability and validity in previous studies,[40] and the Cronbach's α for the family relationship in this sample was 0.867.

Data Analyses

All analysis was conducted in SPSS 26. The current study first calculated descriptive statistics for the participants' demographic characteristics and Spearman correlation analysis of uncertainty stress, depressive symptoms, suicide behavior, and family relationship by using SPSS 26. Mean and Standard Deviations (SD) were used to measure quantitative variables. Number and Percentage were used to measure categorical variables. Then Model 4 and Model 58 from PROCESS 3.5[41] were used to evaluate the mediation effect and mediated moderation effect between the interest variables. 5000 bootstrapped samples were generated to estimate the confidence interval of the indirect effect and the 95% CI without zero denotes statistical significance.[42] Furthermore, we calculated the simple slopes using the "pick-A-point" approach to investigate the changes in the link between uncertainty stress and suicide behavior with the increase in family relationship.[43] All the raw scores were transformed into z-scores to obtain the standardized regression coefficient. In all statistical analyses, significance at $P<0.05$ (two-sided) was used as a control. Additionally, factors like age, gender, grade, only-child, ethnicity, residence, sexual orientation, and living expenses were controlled in all primary analyses.

Results

Participants

As is shown in Table 1, a total of 1828 university students participated in this survey. The mean age of participants was 20.09 years (*SD*=1.18), and the majority participants were female (69.47%) and ethnic Han (97.10%). Sophomores and juniors accounted for 82.04% of all participants. About half of the participants are the only child (50.00%) or live in urban areas (56.51%). Most university students have a monthly living expense of 1001 to 2000 yuan (79.16%). In addition, 89.55% of university students reported that they are heterosexual and not of any other sexual orientation.

Table 1 Sociodemographic Characteristics of University Students (n =1828)

Characteristics	Frequency (Mean)	Percentage (SD)
Age[a]	20.09	1.18
Gender[b]		
Male	558	30.53
Female	1270	69.47
Grade		
Freshman	279	15.26
Sophomore	831	45.50
Junior	668	36.54
Senior and above	50	2.74
Only child		
Yes	914	50.00
No	914	50.00
Ethnicity		
Ethnicity Han	1775	97.10
Ethnicity minorities	53	2.90
Residence		
Urban	1033	56.51
Rural	795	43.49
Sexual orientation		
Heterosexual	1637	89.55
Homosexual	40	2.19
Bisexuality	108	5.90
Other	43	2.35
Living expenses (yuan)		
≤1000	93	5.09
1001–2000	1447	79.16
2001–3000	227	12.42
≥3000	61	3.33

Note: [a]Below data are shown as mean (SD), [b]Below data are shown as n (%).

Correlation Analysis

Means, standard deviations and correlations for all the research variables are presented in Table 2. The results showed that uncertainty stress was significantly positively associated with depressive symptoms (r=0.612, P<0.001) and suicide behavior (r=0.235, P<0.001). Depressive symptoms were significantly negatively correlated with family relationship (r=−0.318, P<0.001) and positively correlated with suicide behavior (r=0.265, P<0.001). Family relationship was significantly negatively correlated with suicide behavior (r=−0.208, P<0.001) and uncertainty stress (r=−0.262, P<0.001).

Table 2 Correlation Between Uncertainty Stress, Depressive Symptoms, Family Relationship, and Suicide Behavior Among University Students

Variables	1	2	3	4
1.Uncertainty stress	1			
2.Depressive symptoms	0.612***	1		
3. Family relationship	−0.262***	−0.318***	1	
4. Suicide behavior	0.235***	0.265***	−0.208***	1

Notes: ***P < 0.001.

Testing for Mediation Effect

Results revealed that (Table 3 and Table 4) uncertainty stress positively predicted suicide behavior (β = 0.21, P<0.001). Uncertainty stress was positively associated with depressive symptoms (β = 0.65, P<0.001), and depressive symptoms positively predicted suicide behavior (β = 0.22, P<0.001). When we added depressive symptoms to the model, uncertainty stress was still positively correlated with suicide behavior (β = 0.07, P<0.05). The indirect effect of uncertainty stress on suicide behavior was 0.14, 95% CI [0.10,0.19]; the direct effect was 0.07, 95% CI [0.01,0.13]; the total effect was 0.22, 95% CI [0.16,0.27]; and the ratio of the indirect effect on the total effect was 67.12%.

Testing for Moderation Mediation

As Table 5 illustrates, in Model1, uncertainty stress positively predicted depressive symptoms, and this relationship was moderated by family relationship (β= −0.06, P<0.001). For descriptive purpose, we plotted predicted depressive symptoms against uncertainty stress, separately for low and high family relationship (Figure 2). Simple slope tests showed that for low family relationship university students, uncertainty stress was significantly and positively associated with depressive symptoms (b_{simple} = 0.67, P<0.001). However, for high family relationship university students, this association was still significant but weaker (b_{simple} = 0.54, P<0.001). Model 2 indicated that the effect of depressive symptoms on suicide behavior was also

Table 3 Mediation Modeling Analysis of the Relationship Among Uncertainty Stress, Depressive Symptoms and Suicide

Predictors	Model1 (Suicide Behavior)		Model2 (Depressive Symptoms)		Model3 (Suicide Behavior)	
	β	t	β	t	β	t
Uncertainty stress	0.21	9.45***	0.65	36.15***	0.07	2.40*
Depressive symptoms					0.22	7.60***
R^2	0.07		0.42		0.10	
F	14.53		147.69		19.26	

Note: *P < 0.05, ***P < 0.001.

Table 4 Effect Value of Total Effect, Mediation Effect and Direct Effect

	Effect	BootSE	BootLLCI	BootULCI	Effect of Ratio
Total effect	0.22	0.03	0.16	0.27	100.00%
Mediation effect	0.14	0.03	0.10	0.19	67.12%
Direct effect	0.07	0.03	0.01	0.13	32.79%

Table 5 Moderation Mediation Effect of Family Relationship Between Uncertainty Stress and Suicide Through Depressive Symptoms

Predictors	Model1 (Depressive Symptoms)		Model2 (Suicide Behavior)	
	β	t	β	t
Uncertainty stress	0.60	33.29***	0.06	2.14*
Family relationship	−0.16	−8.62***	−0.11	−4.70***
Uncertainty stress×family relationship	−0.06	−3.97***	0.04	1.47
Depressive symptoms			0.18	5.81***
Family relationship×Depressive symptoms			−0.08	−3.13**
R^2	0.45		0.11	
F	137.22		18.02	

Note: *P < 0.05, **P < 0.01, ***P < 0.001.

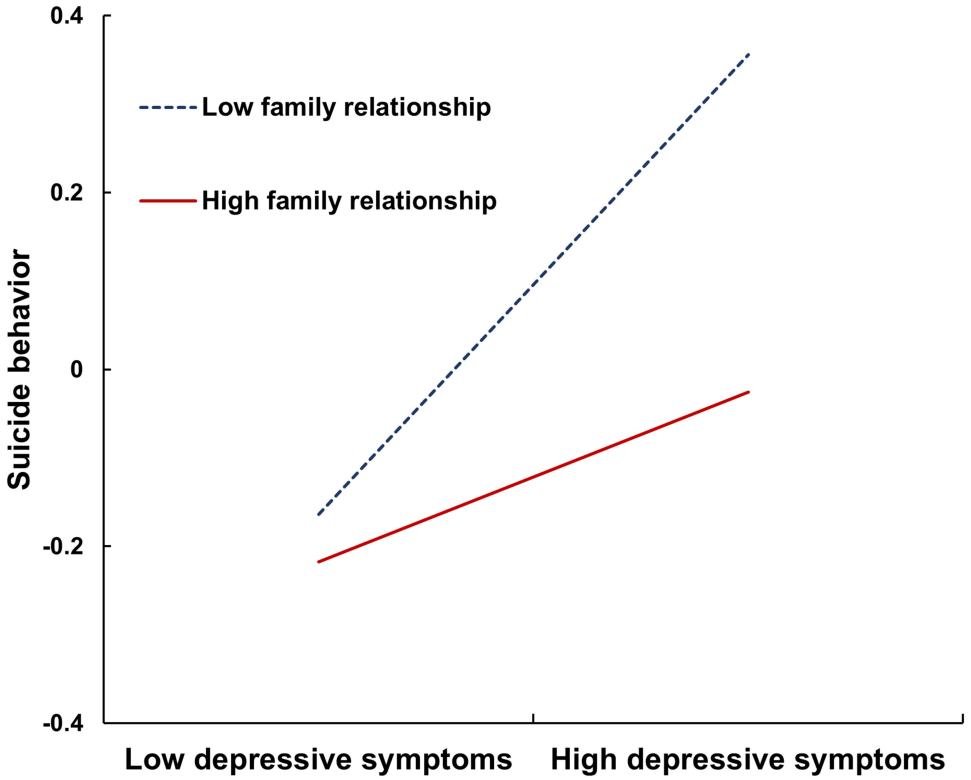

Figure 2 The interaction between uncertainty stress and family relationship on depressive symptoms.

moderated by family relationship (β= −0.08, P<0.001). For descriptive purpose, we plotted predicted suicide behavior against depressive symptoms, separately for low and high family relationship (Figure 3). Simple slope tests showed that for university students with low family relationship, depressive symptoms were significantly and positively associated with suicide behavior (b_{simple} = 0.26, P<0.001). However, for university students with high family relationship, this link was still significant but much weaker (b_{simple} = 0.10, P<0.05). Besides, uncertainty stress was significantly associated with suicide behavior (β=0.06, P<0.05), but this association was not moderated by family relationship (β=0.04, P>0.05). That is, the family relationship did not moderate the relationship between uncertainty stress and suicide behavior.

The bias-corrected percentile bootstrap results further showed that the indirect effect of uncertainty stress on suicide behavior through depressive symptoms was moderated by family relationship. Specifically, for university students with low family relationship, uncertainty stress had a positive effect on suicide behavior through depressive symptoms, b = 0.173, SE = 0.041, 95% CI = [0.104, 0.254]. With family relationship increasing, the mediating effect of depressive symptoms become weaker, b = 0.052, SE = 0.025, 95% CI = [0.004, 0.102]. These results indicated that family relationship moderated the path between uncertainty stress and depressive symptoms and the path between depressive symptoms and suicide behavior.

Discussion

The current research is the first to examine the association between uncertainty stress and suicide behavior among Chinese university students, in addition to examining the mediating effects of depressive symptoms and the moderating effects of family relationship. Results demonstrated a positive correlation between uncertainty stress and suicide behavior. Moreover, our analyses suggests that depressive symptoms may partially mediate the link between uncertainty stress and suicide behavior. These findings agreed with earlier studies.[44]

The Mediating Role of Depressive Symptoms

This study found a clear positive correlation between uncertainty stress and suicide behavior. Besides, depressive symptoms play a partial mediating role between uncertainty stress and suicide behavior. The sensitivity of Chinese

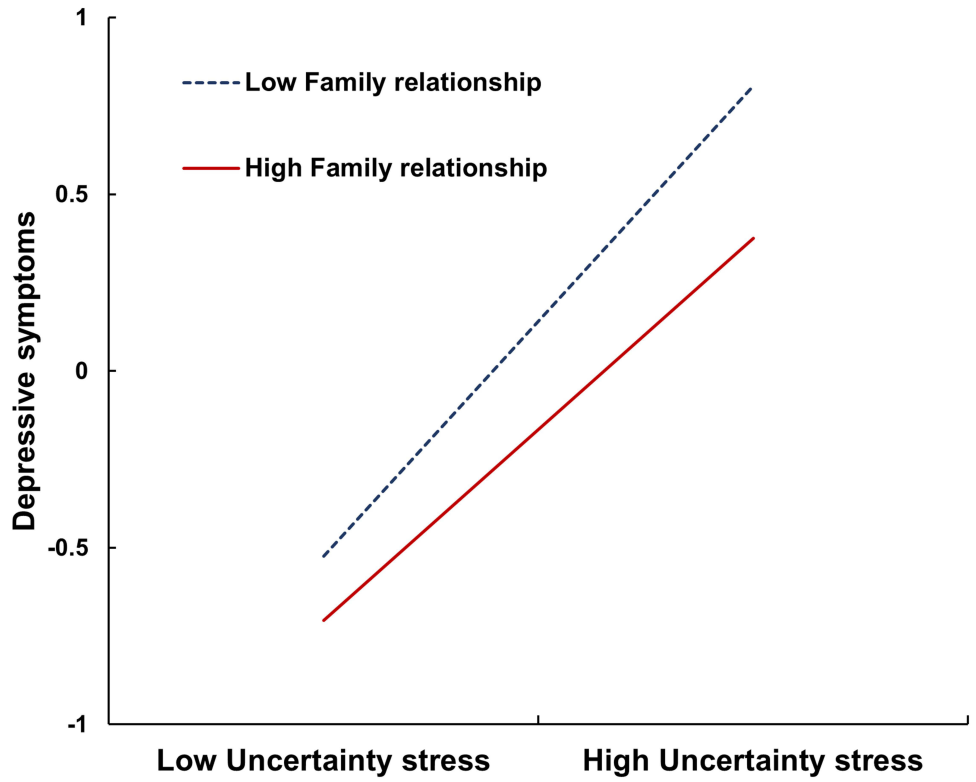

Figure 3 The interaction between depressive symptoms and family relationship on suicide behavior.

students to uncertainty stress may be related to traditional Chinese culture. Eastern cultures are more conservative and tend to comply with social rules, such as avoiding uncertainty and pursuing a harmonious and stable environment.[45] Under the influence of pragmatism, the Chinese are more likely to seek short-term and efficient solutions to problems and view uncertainty as a constant threat that must be addressed.[46,47] However, uncertainty is a long-term psychological experience and requires more mental capacity,[27] which directly leads to more experience of stress, anxiety, and neuroticism.[47] Furthermore, individuals are more likely to adopt irrational and immature coping styles when confronting high pressure.[13] High levels of uncertainty stress force characters to adopt inactive handling strategies, which can amplify their original negative emotions, such as depression.[21] Studies also show that depression patients tend to be more psychologically vulnerable and hostile, and exhibit more negative emotions in response to stress,[48] thus increasing suicidal tendencies.[49] Complexity and ambiguity are two characteristics of uncertainty,[50] and individuals would experience greater stress under unknown, potentially threatening, and uncertain conditions.[51] Overall, university students want to solve the problems caused by uncertainty stress through suicide, maybe because suicide can control their environment and bring a sense of order and balance,[52] which can provide a cogent basis for understanding suicide.

Life is dynamic and changing, and there is no permanent solution to a problem. Therefore, being flexible and full of wisdom is more powerful than a single solution. The stress of uncertainty is always there and cannot be removed.[53] Only by having the courage to try and change and accumulating social experience can we cope with uncertainty stress calmly.

The Moderating Role of Family Relationship

Our results also indicated that family relationship moderated the relation between uncertainty stress and depressive symptoms and the relation between depressive symptoms and suicide. This is roughly consistent with the previous studies that family environment moderates the link between stress and suicide.[54,55] Specifically, the effects of uncertainty stress on depressive symptoms and depressive symptoms on suicide were stronger for university students with low rather than high family relationship. That implies low quality family relationships can worsen the risk of depression and suicide brought by uncertainty stress, while high quality family relationships can alleviate these associations.

Family environment, especially parental support, plays a critical role in the development of offspring's positive emotions.[56] Based on the attachment theory, a harmonious relationship between family members can satisfy basic psychological needs and bring positive emotional adaptation to individuals.[57] Individuals with stronger family cohesion exhibit higher levels of subjective well-being and experience more meaning and purpose in their lives.[58,59] Furthermore, good marital quality leads to better social adaptation in the childhood period and brings fewer explicit and implicit behavioral problems.[60–62]

The poor family relationship represents low cohesion and high conflict,[33,63,64] which bring about more disastrous influences. Marital conflict will cause long-term emotional stress in the offspring and increase their negative emotions and insecurity, which will affect the offspring's emotional regulation and expression, causing uncontrollable negative emotions.[65] In addition to this direct effect, the negative emotions brought by marital conflict can also damage the parent-child relationship, indirectly cause the psychological development of the offspring, and bring about unhealthy behavior.[66] Besides, a poor family relationship also leads to limited opportunities for individuals to learn social problem-solving skills, which would bring about a lack of support needed to cushion the effects of stress or depression.[55]

With the increasing age, teenagers are gradually separated from their parents and the perceived family support is also gradually decreased.[67] However, the results of this study show that although the central living place of university students is transferring from family to school, the influence of family factors on young adults is still persistent and far-reaching, which suggests that a complete and harmonious family plays an irreplaceable role in an individual's development.

Limitations

Some limitations in this research should be mentioned. Firstly, all measurements were obtained through self-reported, which may have recall bias and common method bias. Multiple-source measurements should be adopted in appropriate situations in the future studies. Secondly, this study only sampled from three economically developed southern regions, so that the sample representativeness may be insufficient. Moreover, we utilized the cross-sectional research, which was unable to infer the causal relationship between all variables. A longitudinal study should be conducted in the future to address this limitation.

Conclusions

Although previous research has shown the positive relationship between stress and suicide behavior, the present study goes beyond that and confirms the relationship between uncertainty stress, depressive symptoms, and suicide behavior. Additionally, we also provided empirical evidence for the mediating mechanism of depressive symptoms between uncertainty stress and suicide behavior. Furthermore, we discovered that the perfect quality of family relationship plays a debilitating role in the mediation impact of depressive symptoms among uncertainty stress and suicide behavior. This study indicates that lowering uncertainty stress and creating a good family environment is of great significance to the prevention of negative emotions and behaviors of university students. These results inspire educators and parents to create a harmonious school climate and family environment, so as to help university students build a healthy psychology and avoid suicide.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author, Wei Wang, upon reasonable request.

Ethics Approval and Consent to Participate

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Medical Ethics Committee of Xuzhou Medical University. We have obtained the informed consent from the study participants.

Consent for Publication

All authors consent for publishing this work.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

There are no conflicts of interest for the authors to disclose.

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